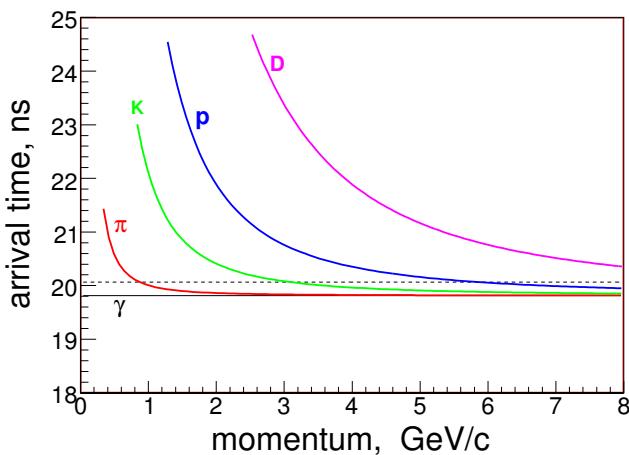


Today's talk will cover followings:

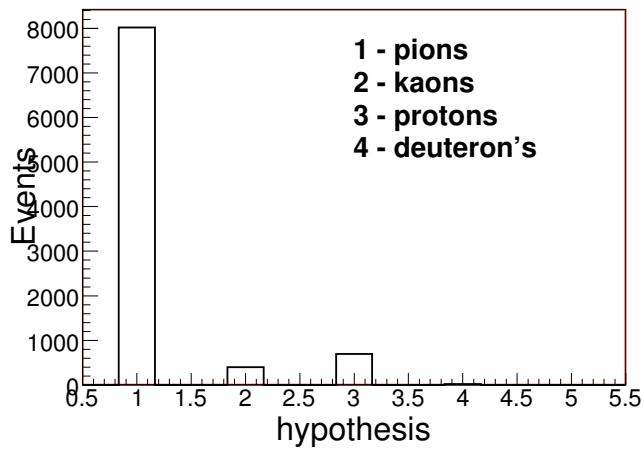
- more about the particle hypothesis selection
- ToF time resolution for the high momentum pions
- use above time resolution as an input to the hypothesis selection
- calculate the time resolution for some bars

hypothesis selection concept



- Problem: kaons and protons populate the right shoulder of the pion peak. Plot illustrates that it will happen from 1.5 GeV/c and up to higher momentum
- As a result the time distribution with single pion hypothesis will be broadening
- Solution: by considering the alternative ($\pi/K/p/D$) hypothesis we can reduce this effect
- How or when to turn-on the alternative hypothesis?
- Answer: use it at the certain momentum range, for an example when K/p/D bands are start to go away from pion in level of greater than one sigma ($\sigma \approx 250$ ps, dashed line). Momentum ranges:
 - kaons below of 3 GeV/c
 - protons below of 5.8 GeV/c
 - deuteron's below of 5 GeV/c

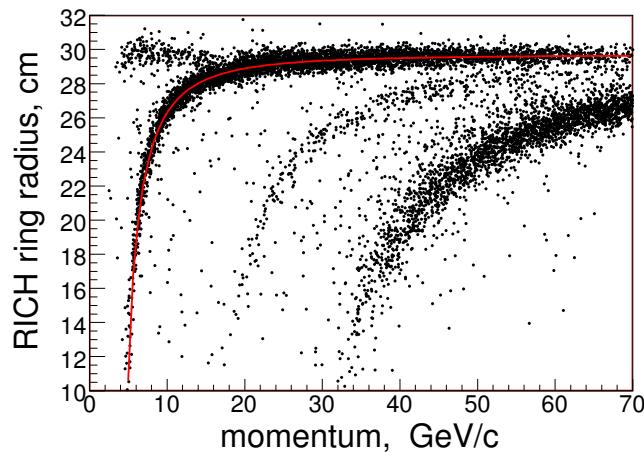
more on hypothesis selection



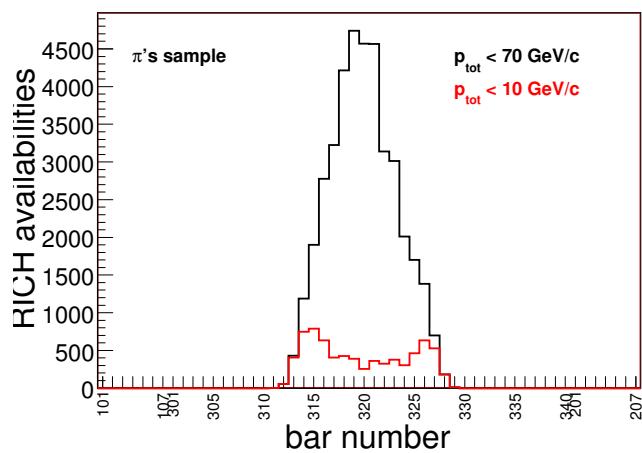
- consider the same particle hypothesis for the top and bottom pmt's
- if they differ, then use the pion hypothesis

Plot on left illustrates how often which hypothesis was selected, bar 307.

RICH info



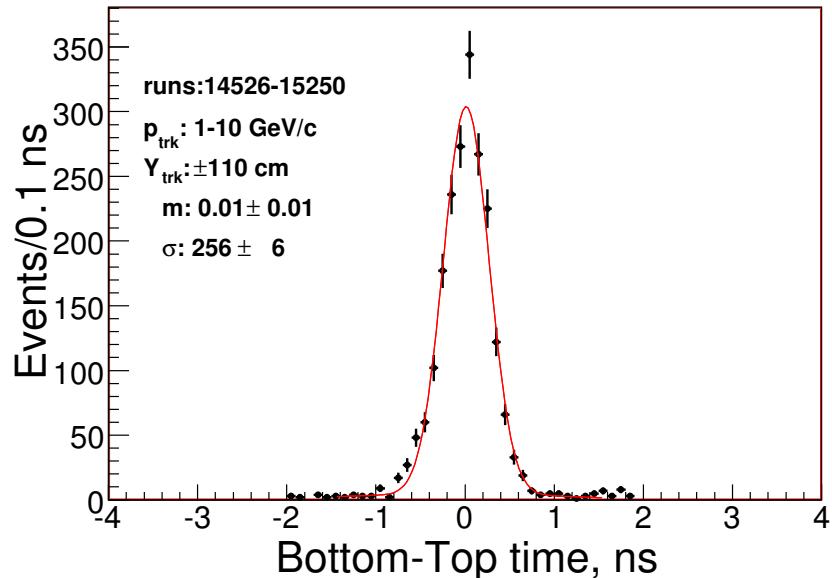
Upper plot: The RICH ring radius vs the momentum distribution. The band with the red curve illustrates pions. Pion selection criteria: consider the data point as a pion if its position are consistent with the predicted curve within ± 1 cm.



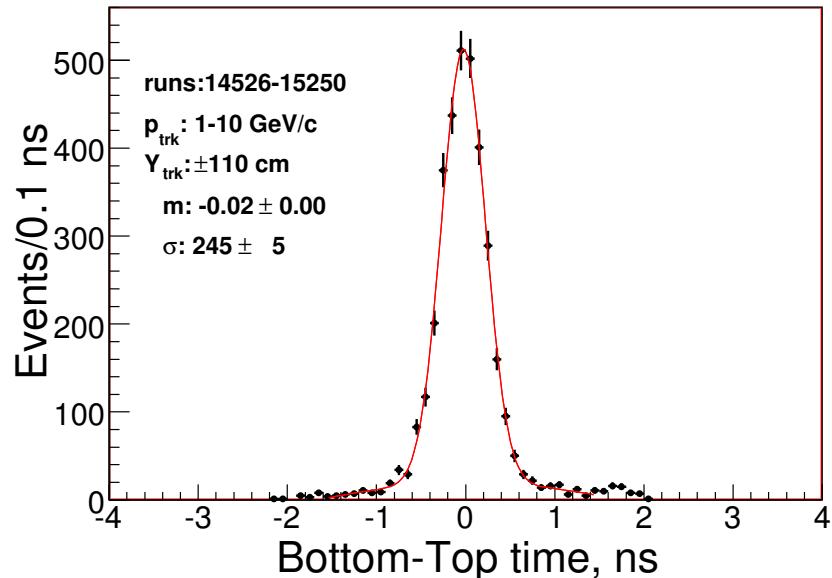
Bottom plot: The RICH info availabilities with identified pions vs the ToF bar number. Based on this plot we select the bar 319 for further studies.

Bottom - Top time difference: bar 307 vs bar 319

tDif, bar:307



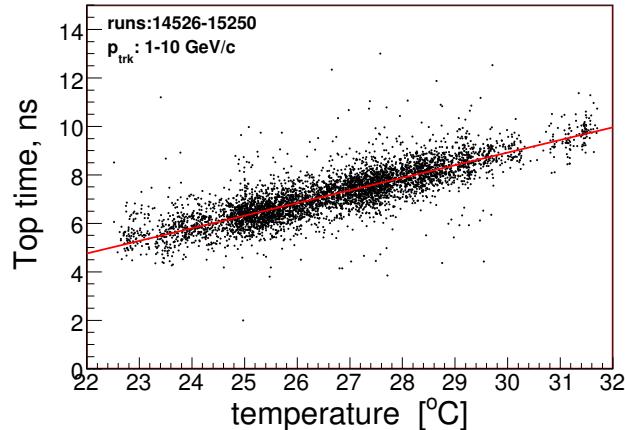
tDif, bar:319



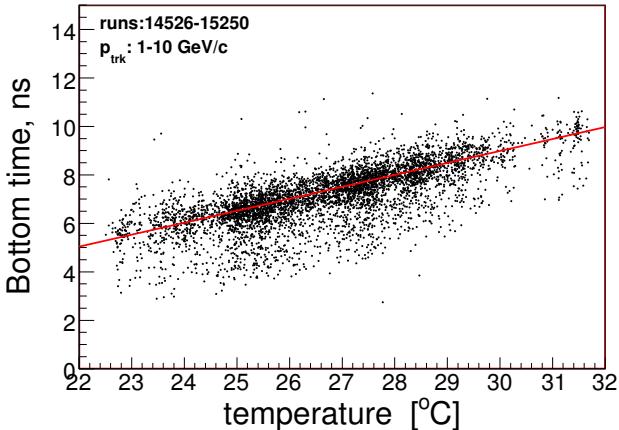
The bottom - top time distributions for bars 307 and 319. Data: NuMI target data. Data for bar 307 - low momentum tracks within ± 10 cm, a single pion hypothesis approach. Bar 319 - high momentum pions. By viewing this results we choose 250 ps as a reference time resolution (on page 2).

TOF time vs temperature and pulse height, bar 104

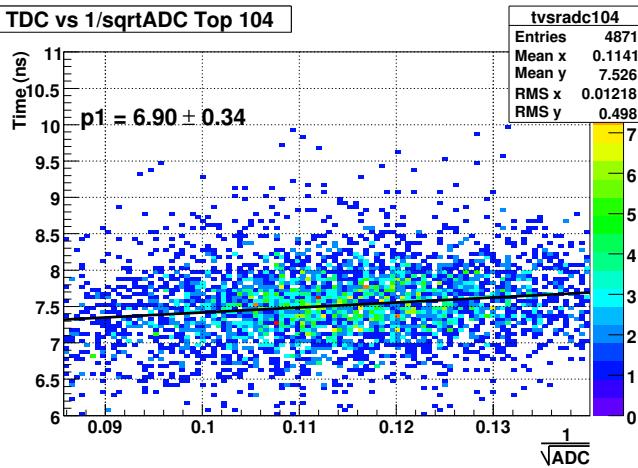
tTop_vs_tmp, bar:104



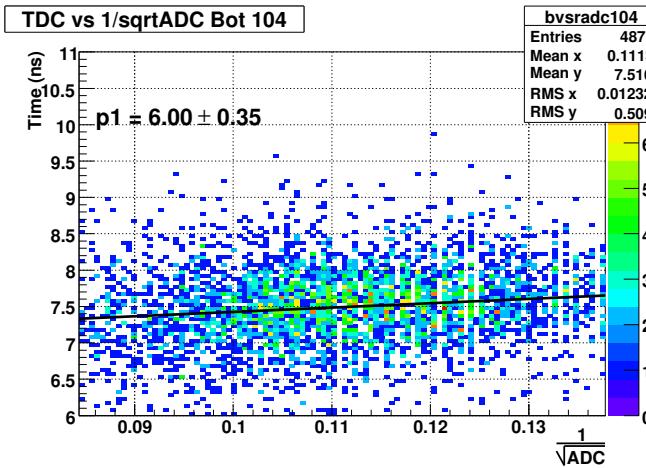
tBot_vs_tmp, bar:104



TDC vs 1/sqrtADC Top 104



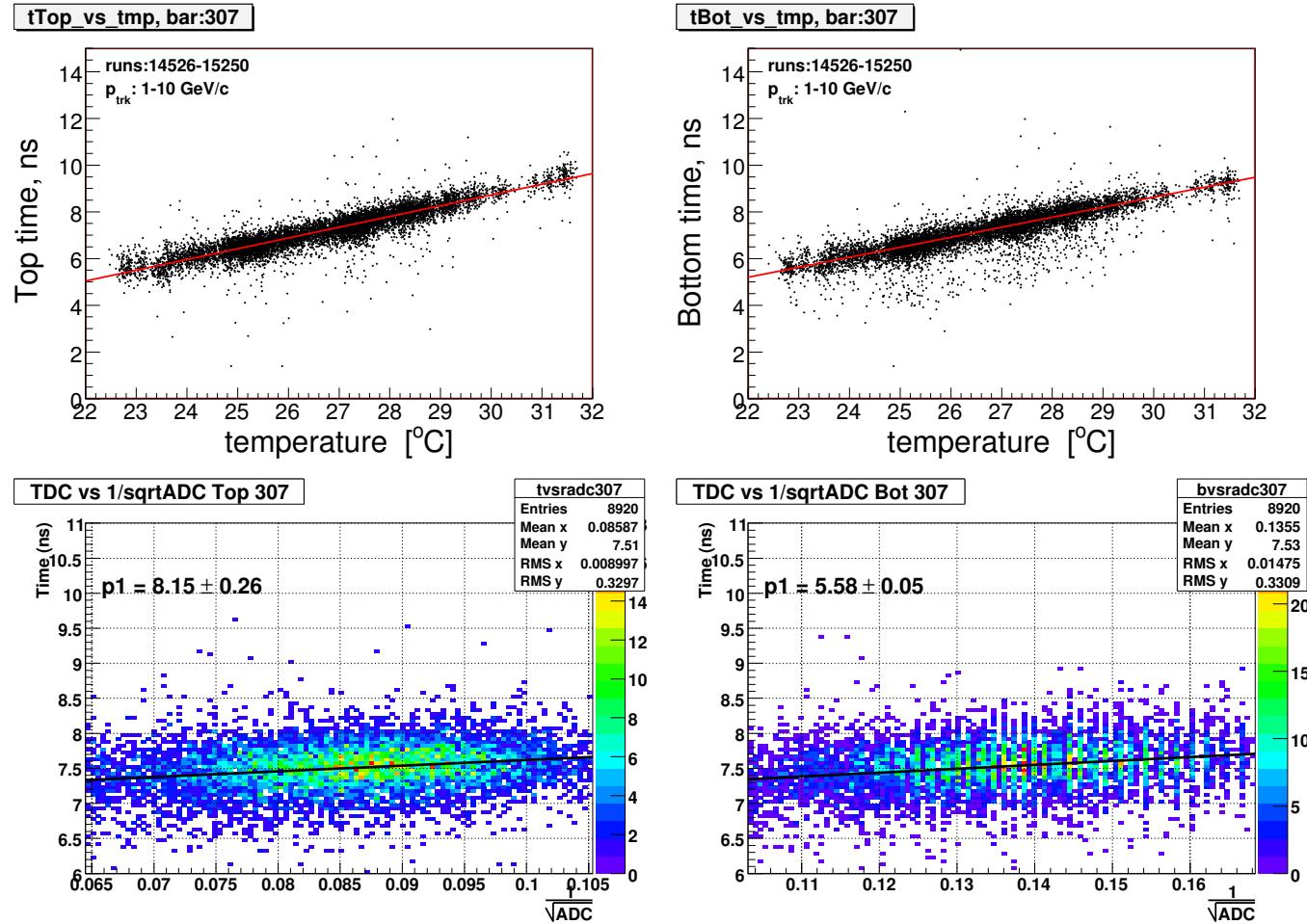
TDC vs 1/sqrtADC Bot 104



The ToF time vs the temperature and vs $1/\sqrt{ADC}$, bar 104. Data: NuMI target data.

Temperature coefficients: 0.5206 ± 0.0027 (top) and 0.4924 ± 0.0031 (bottom).

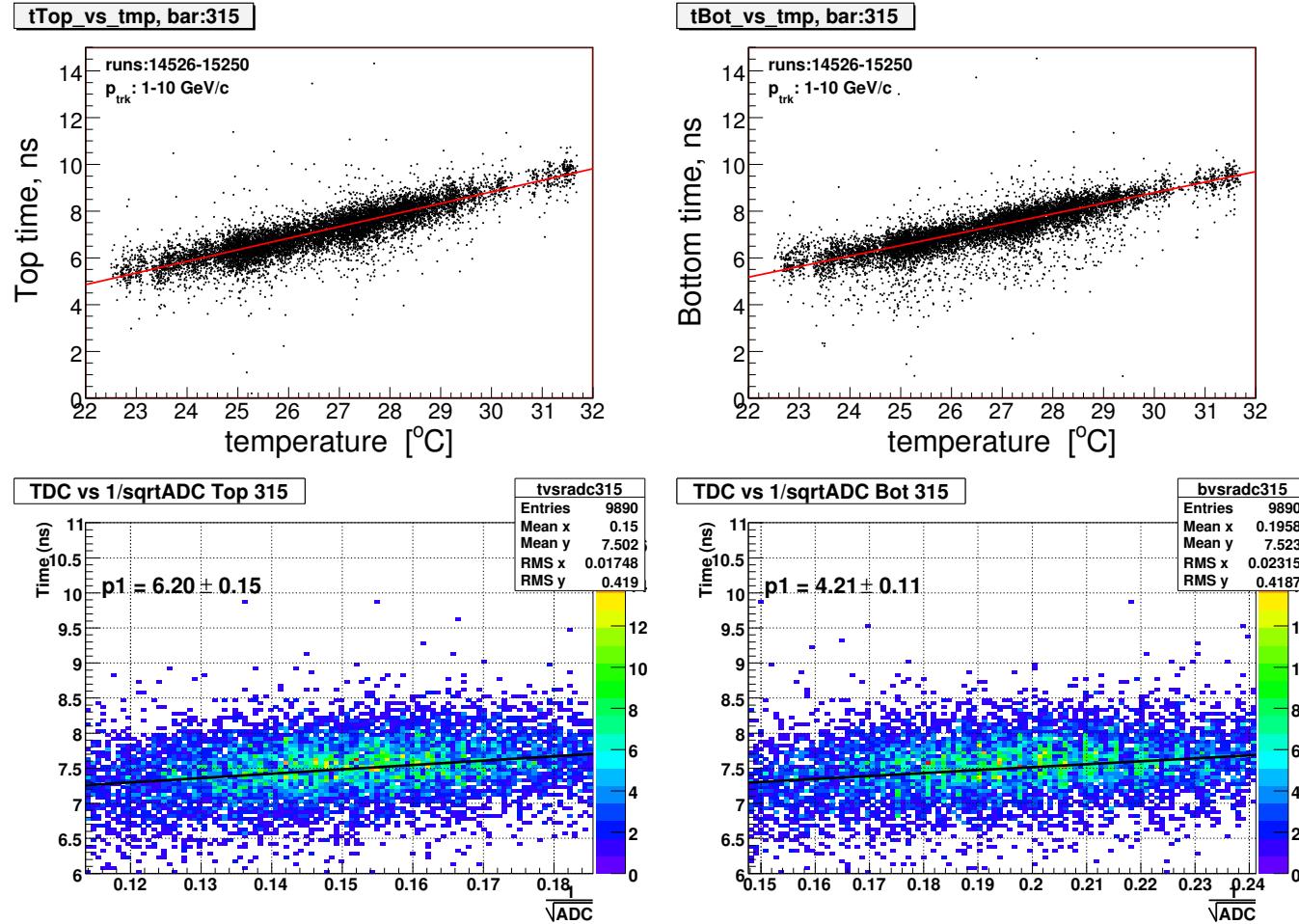
TOF time vs temperature and pulse height, bar 307



The ToF time vs the temperature and vs $1/\sqrt{ADC}$, bar 307. Data: NuMI target data.

Temperature coefficients: 0.4599 ± 0.0017 (top) and 0.4278 ± 0.0016 (bottom)

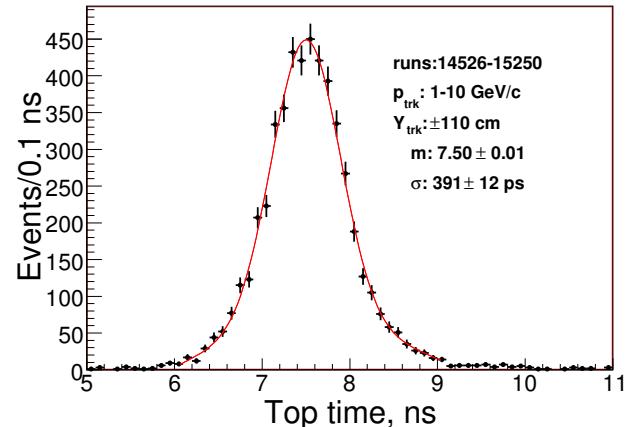
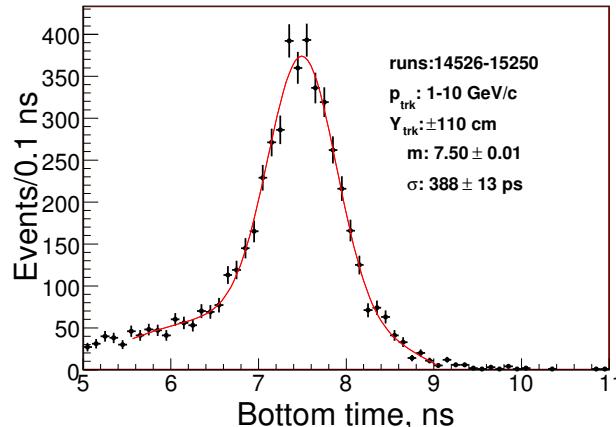
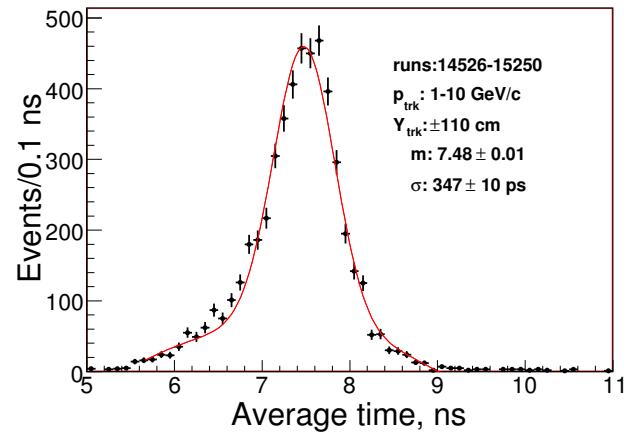
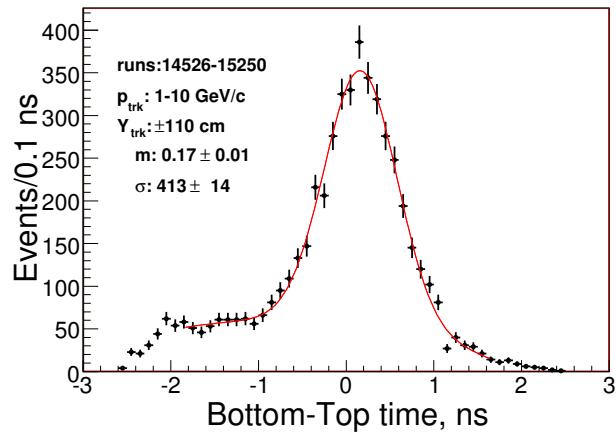
TOF time vs temperature and pulse height, bar 315



The ToF time vs the temperature and vs $1/\sqrt{ADC}$, bar 315. Data: NuMI target data.

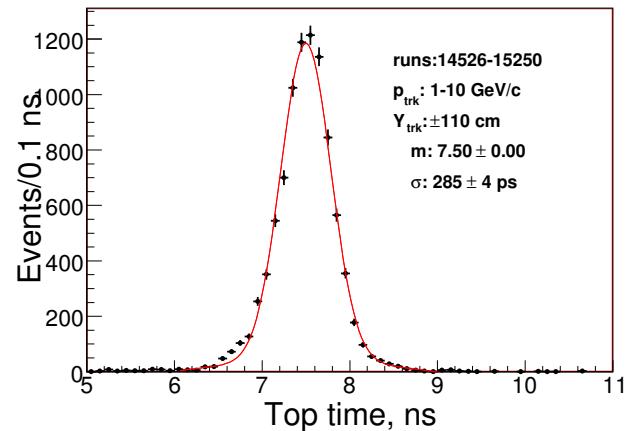
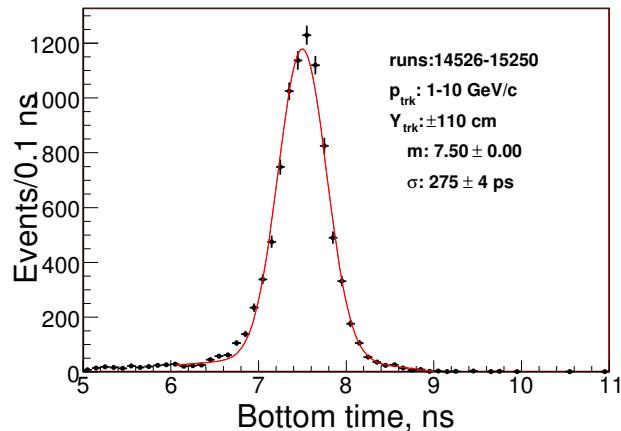
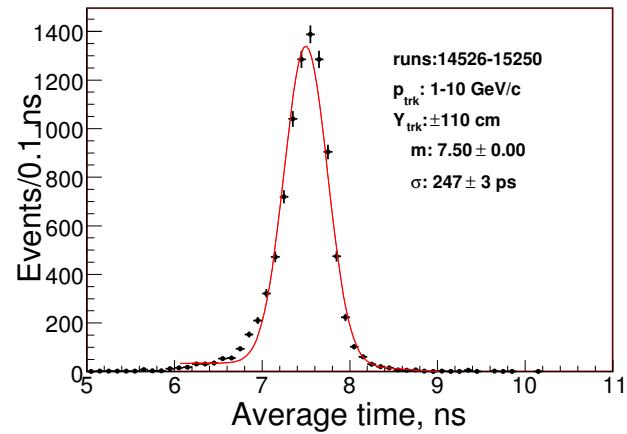
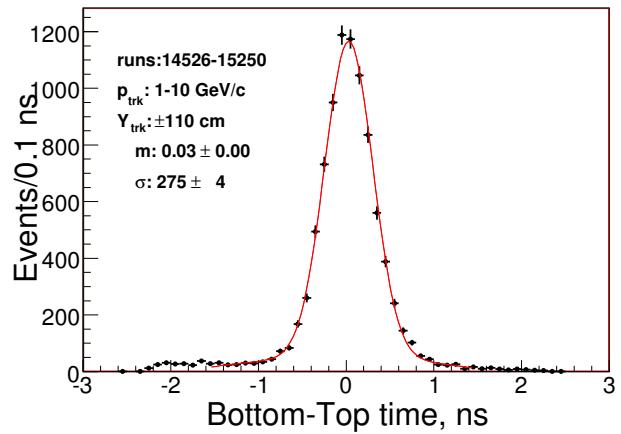
Temperature coefficients: 0.4955 ± 0.0018 (top) and 0.4518 ± 0.0018 (bottom).

bar 104 time resolution

tTop, bar:104

tBot, bar:104

tAve, bar:104

tDif, bar:104


The ToF time distributions with the multi-particle hypothesis approach, bar 104. Data: NuMI target data

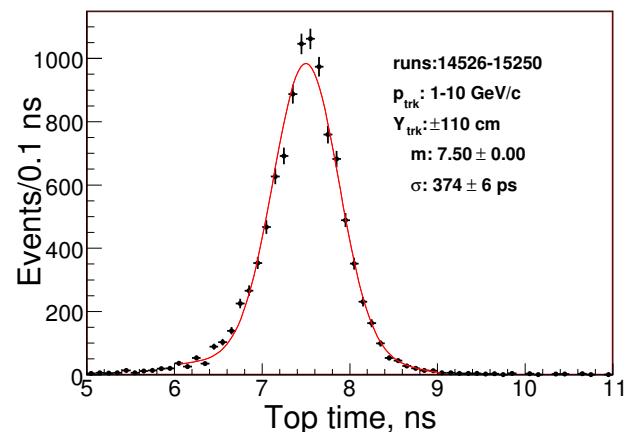
bar 307 time resolution

tTop, bar:307

tBot, bar:307

tAve, bar:307

tDif, bar:307


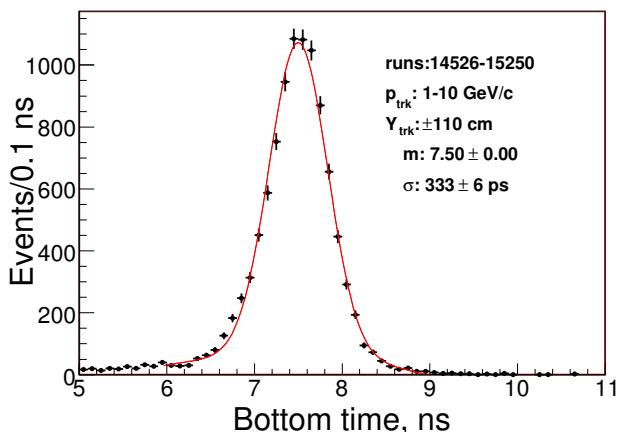
The ToF time distributions with the multi-particle hypothesis approach, bar 307. Data: NuMI target data

bar 315 time resolution

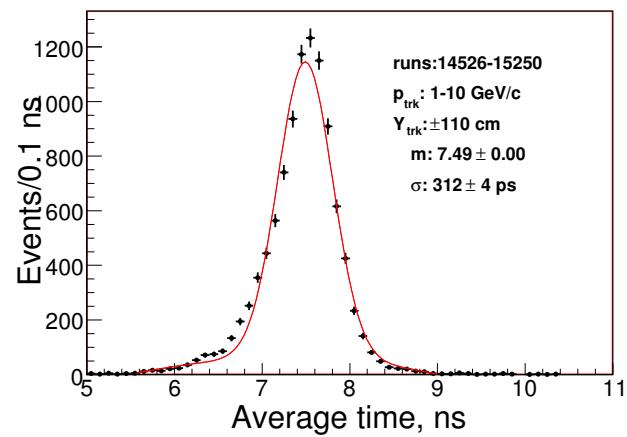
tTop, bar:315



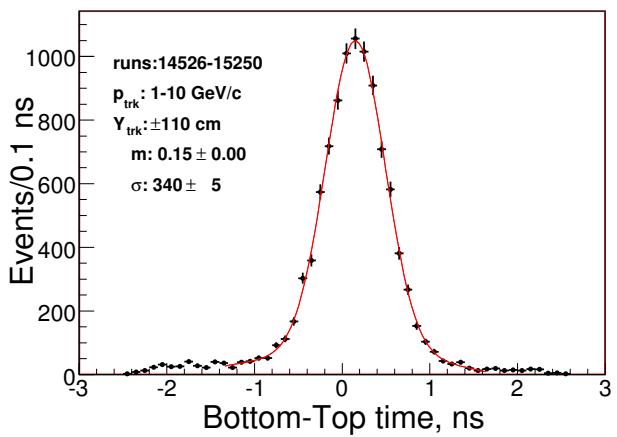
tBot, bar:315



tAve, bar:315



tDif, bar:315



The ToF time distributions with the multi-particle hypothesis approach, bar 315. Data: NuMI target data

ToF cuts

	bar 104	bar 307	bar 315
number of tracks	28587	29395	57733
single track per bar	24082(84)	25224(86)	43527(75)
TDC time not overflow	24072(100)	25219(100)	43527(100)
no hits on adjacent bars	8537(35)	11248(45)	16444(38)
t0 time cut $ t_o < 1.0$ ns	8516(99)	11219(99)	16405(99)
$p_{tot} < 10$ GeV/c	8486(99)	10951(98)	12128(74)
ADC above peds	8188(96)	10833(99)	11827(98)
$Y_{trk} < \pm 110$ cm	5841(71)	9939(92)	11178(95)
Δt -track consistency	5160(88)	9133(92)	10214(91)
total efficiency, %	18	31	18

Table 1: The ToF cuts and the fraction of the survived events in %.